

TIER 1

**UNDERGROUND INJECTION CONTROL  
PERMIT APPLICATION**

**Ute Tribal # 20-15**  
**574' FSL & 1806' FEL**  
**Sec. 20, T5S-R3W**  
**Duchesne County, Utah**  
**API # 43-013-34051**

July 2015

Prepared for:  
Bruce Suchomel  
Groundwater Program, Mail Code 8P-W-UIC  
U.S. Environmental Protection Agency  
1595 Wynkoop St  
Denver, CO 80202-1129

Prepared by:  
Petroglyph Energy, INC.  
960 Broadway Avenue, Suite 500, P.O. Box 70019  
Boise, Idaho 83707  
(208) 685-7600  
FAX (208) 685-7605



TIER 1

• HOW WAS USDW DEPTH  
DERIVED  
• NO SUNDRY REPORTS.  
• MISSING DATA ON AOR  
WELLS  
• NO CBLS FOR AOR WELLS  
2015

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## **LIST OF ATTACHMENTS**

Attachment No. 1	Area Topography Map
Attachment No. 2	Site Map
Attachment No. 3	Map of the A-Marker surface
Attachment No. 4	Cross-Sections of the injection formation
Attachment No. 5	Water Analysis
Attachment No. 6	Completion data for all wells in the AOR
Attachment No. 7	CBL for the UIC well
Attachment No. 8	Open hole log for the UIC well
Attachment No. 9	List of owners and Affidavit Notification
Attachment No. 10	Well bore diagrams for the UIC well
Attachment No. 11	P&A procedure
Attachment No. 12	MIT procedure
Attachment No. 13	Surety Bond letter



**SUMMARY DOCUMENT**

**UIC WELL APPLICATION**

**Ute Tribal 20-15**

**API # 43-013-34051**

The following document contains information provided in support of the application for the conversion of the Ute Tribal 20-15 well to an injection well in the Green River formation in the Antelope Creek Field in Duchesne County, Utah.

The Antelope Creek Field falls within the Uintah and Ouray Indian reservations and is within Indian Country; therefore, for facilities located on the reservation, only EPA-issued UIC permits are necessary for compliance with UIC regulations.

The EPA has issued an Area Permit #UT20736-00000 for the Underground Injection Control for the Antelope Creek Field. This area permit allows for additional producing wells to be converted to injection wells for enhanced recovery.

- (1) Petroglyph Energy, Inc. (Petroglyph) is the operator and only working interest owner of wells located in the Antelope creek Field, Duchesne County, Utah. Petroglyph's business address is provided below:

Petroglyph Energy, Inc.  
960 Broadway Avenue, Suite 500  
P.O. Box 70019  
Boise, ID 83707

- (2) Enclosed as Attachment No. 1 is a topographic map of a portion of the Antelope Creek Field, identifying all wells located in this area. The legal location for the Ute Tribal 20-15 is 574' FSL & 1806' FEL SW/SE Sec. 20, T5S-R3W.
- (3) Attachment No. 2 is a map of the well. This map shows a circle with a ¼ mile radius centered on the Ute Tribal 20-15 well. The ¼ mile radius encompasses the area of review, AOR, within which Petroglyph is required to investigate all wells for mechanical integrity. The ¼ mile radius also identifies mineral ownership; all lands within the AOR are leased to Petroglyph by the Ute Tribe as indicated by yellow shading. The AOR has Ute Tribal 20-14o, Ute Tribal 20-16, and Ute Tribal 29-02 well(s) located in its ¼ mile radius.



- (4) Petroglyph proposes to utilize the Ute Tribal 20-15 as an injection well for enhanced recovery in the Antelope Creek Field.
- (5) Injection Zone – The injection intervals are between 4042' and 6025' True Vertical Depth and located in the lower portion of the Green River Formation. The injection zone is confined within a 1983' section between the Green River "A" Lime marker bed and the top of the Basal Carbonate in the lower part of the formation. The injection zone is composed of lenticular calcareous sandstones interbedded with low permeable carbonates and calcareous shales. The lenticular sandstones vary in thickness from 1 to 30 feet.

Confining Zone – The overall confining strata above the injection zone consists of impermeable Green River calcareous shales and continuous beds of microcrystalline dolostone. The confining zone in the Ute Tribal 20-15 is 231 feet thick.

Attachment No. 3 is a structure map of the A-Marker surface.

Attachment No. 4 is a cross-section of the injection interval and confining zone.

- (6) Enclosed as Attachment No. 5 are standard analyses of produced water from three batteries that currently serve as central handling facilities for all project producing wells. The analysis of the Green River formation water from the Ute Tribal 18-08 Satellite Battery is 12805 mg/L of total dissolved solids (TDS), Ute Tribal 21-11 Satellite Battery is 15659 mg/L TDS, and Ute Tribal 34-12-D3 Satellite Battery is 14590 mg/L TDS.

Injectate in the field is a mixture of produced water and fresh make-up water. The nearest injection well is the Ute Tribal 21-13, the most recent analysis of the water being injected into the Green River formation at this location is 10309 mg/L TDS. This analysis is also included in Attachment No. 5.

- (7) A summary of completion data from the Ute Tribal 20-15 and offset wells in the AOR are included in Attachment No. 6
- (8) The cement bond log is included in Attachment No. 7.
- (9) The open hole log for the Ute Tribal 20-15 is included in Attachment No. 8.



(10) The Antelope Creek Field is operated under a Cooperative Plan of Development between the Ute Tribe and Petroglyph Energy. At the Ute Tribal 20-15 location, all mineral owners, surface owners and operators located within the AOR ¼ mile radius have been notified of the submitted EPA application to convert to injection. Attachment No. 9 is the Affidavit of Notification to all owners.

(11) Petroglyph requests a maximum surface injection pressure of **1894psi**. The EPA Area Permit No. UT20736-00000 uses the formula:

$$P_m = (0.88\text{psi/ft} - 0.43\text{psi/ft}(S_g)) D$$

Where:

$P_m$  = Maximum surface injection pressure

0.88psi/ft = Fracture gradient

$D$  = Top perforation depth

0.43psi/ft = Hydrostatic pressure/hydraulic head

$S_g$  = Specific gravity of injection fluid

For the Ute Tribal 20-15:

$$\mathbf{1894\text{psi} = (0.88\text{psi/ft} - 0.43(1.00)) 4208\text{ft}}$$

(12) Three wellbore diagrams for the Ute Tribal 20-15 are in Attachment No. 10. One diagram is for production, one for injection, and one for Plug & Abandonment (P&A).

(13) The P&A procedure for this well is shown in Attachment No. 11.

(14) Once the draft permit is issued, Petroglyph will conduct a Mechanical Integrity Test and a static bottom-hole pressure test. The MIT procedure is contained in Attachment No. 12. The conversion work will be satisfactorily completed and submitted to the EPA on Form 7520-12. A wellbore schematic will be included with this form.



- (15) Petroglyph will give proof of financial responsibility by posting a surety bond for the UIC well prior to final permit approval. A copy of this letter is contained in Attachment No. 13.
- (16) Petroglyph will install various gauges on the well so that the injection pressure and tubing/casing annulus pressure can be monitored. The well will be equipped with a flow meter with a cumulative volume recorder.



## Ute Tribal 20-15 Well History

### Well History:

Spud Well: 3/28/2010

Completed: 5/5/2010

First Production: 5/5/2010

### Tops (KB):

**BMSW\* Found at 1489'**

Green River 1504'

**A Marker 4042'**

X Marker 4531'

Douglas Creek 4672'

B Limestone 5048'

Castle Peak 5545'

**Basal Carbonate 6024'**

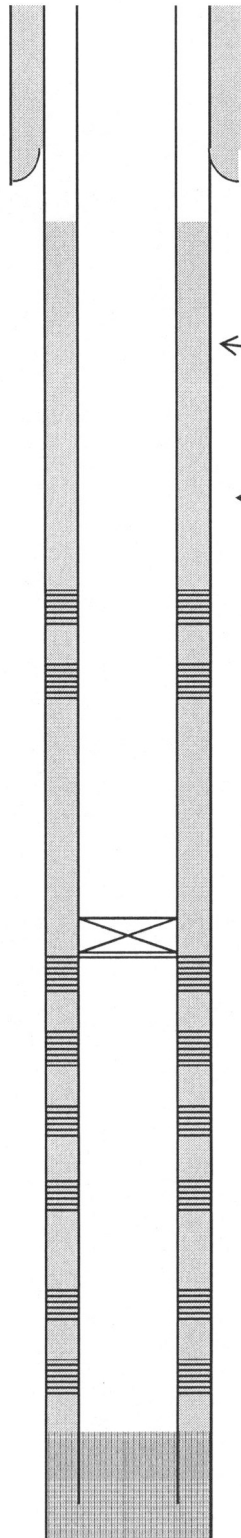
### Perf History

4/20/2010

B06	4240' to 4244'
B06	4250' to 4256'
B08.1	4363' to 4365'
C04	4710' to 4714'
C06	4868' to 4877'
C09.1	4978' to 4981'
D3	5132' to 5139'
D3	5142' to 5146'

4/23/2010

BP	at 5120'
----	----------



GL: 6475'

KB: 6489'

8 5/8" 24# Surface CSG @ 514' KB

cmt'd w/395sx

Surface Hole size 12 1/4"

Cement top @ 770'

5 1/2" 15.5# J-55 CSG @ 6196'

cmt'd w/865 sx

Hole Size 7 7/8" bit

Perf's:

B06 4240' to 4244'

B06 4250' to 4256'

B08.1 4363' to 4365'

C04 4710' to 4714'

C06 4868' to 4877'

C09.1 4978' to 4981'

BP @ 5120'

D3 5132' to 5139'

D3 5142' to 5146'

PBTD @ 6136' KB

TD @ 6197' KB

Petroglyph Operating Co., Inc.

Ute Tribal #20-15

(1806' FEL 574' FSL)

SW SE Section 20, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013340510000

\*Plate 1 Utah Geological Survey Special Study 144.  
(2012). BMSW Elevation Contour Map, Uinta Basin,  
Utah. [map]. (CA 1:200,000)

(Not to Scale)



## Ute Tribal 20-15 Injection

### Well History:

Spud Well: 3/28/2010  
Completed: 5/5/2010  
First Production: 5/5/2010

### Tops (KB):

#### **BMSW\* Found at 1489'**

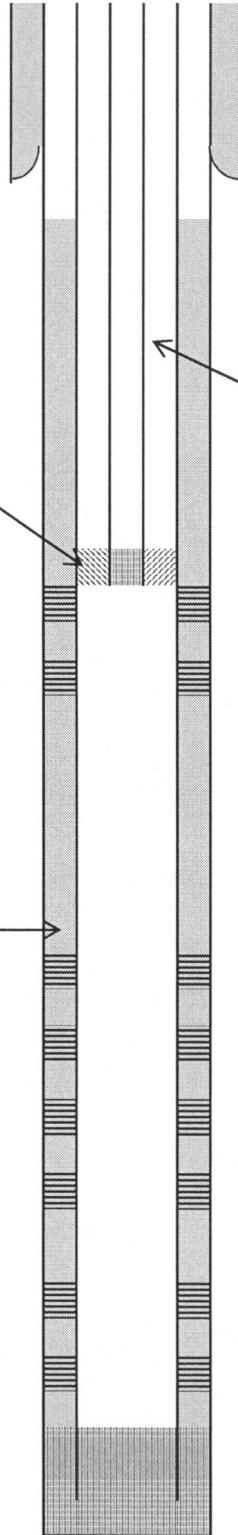
Green River 1504'  
**A Marker 4042'**  
X Marker 4531'  
Douglas Creek 4672'  
B Limestone 5048'  
Castle Peak 5545'  
**Basal Carbonate 6024'**

Injection packer @ 4118'

Remove BP @ 5120'

Petroglyph Operating Co., Inc.  
Ute Tribal #20-15  
(1806' FEL 574' FSL)  
SW SE Section 20, 5S- 3W  
Antelope Creek Field  
Duchesne Co. Utah  
API#: 43013340510000

\*Plate 1 Utah Geological Survey Special Study 144.  
(2012). BMSW Elevation Contour Map, Uinta Basin,  
Utah. [map]. (CA 1:200,000)



(Not to Scale)

GL: 6475'

KB: 6489'

8 5/8" 24# Surface CSG @ 514' KB  
cmt'd w/395sx

Surface Hole size 12 1/4"

Cement top @ 770'

5 1/2" 15.5# J-55 CSG @ 6196'  
cmt'd w/865 sx

Tubing 2 7/8" 6.5# J55

Hole Size 7 7/8" bit

### Perf's:

Add B05 4208' to 4219'

B06 4240' to 4244'

B06 4250' to 4256'

B08.1 4363' to 4365'

Add B08.1 4369' to 4371'

Add B10 4449' to 4458'

Add C04 4708' to 4710'

C04 4710' to 4714'

C06 4868' to 4877'

C09.1 4978' to 4981'

D3 5132' to 5139'

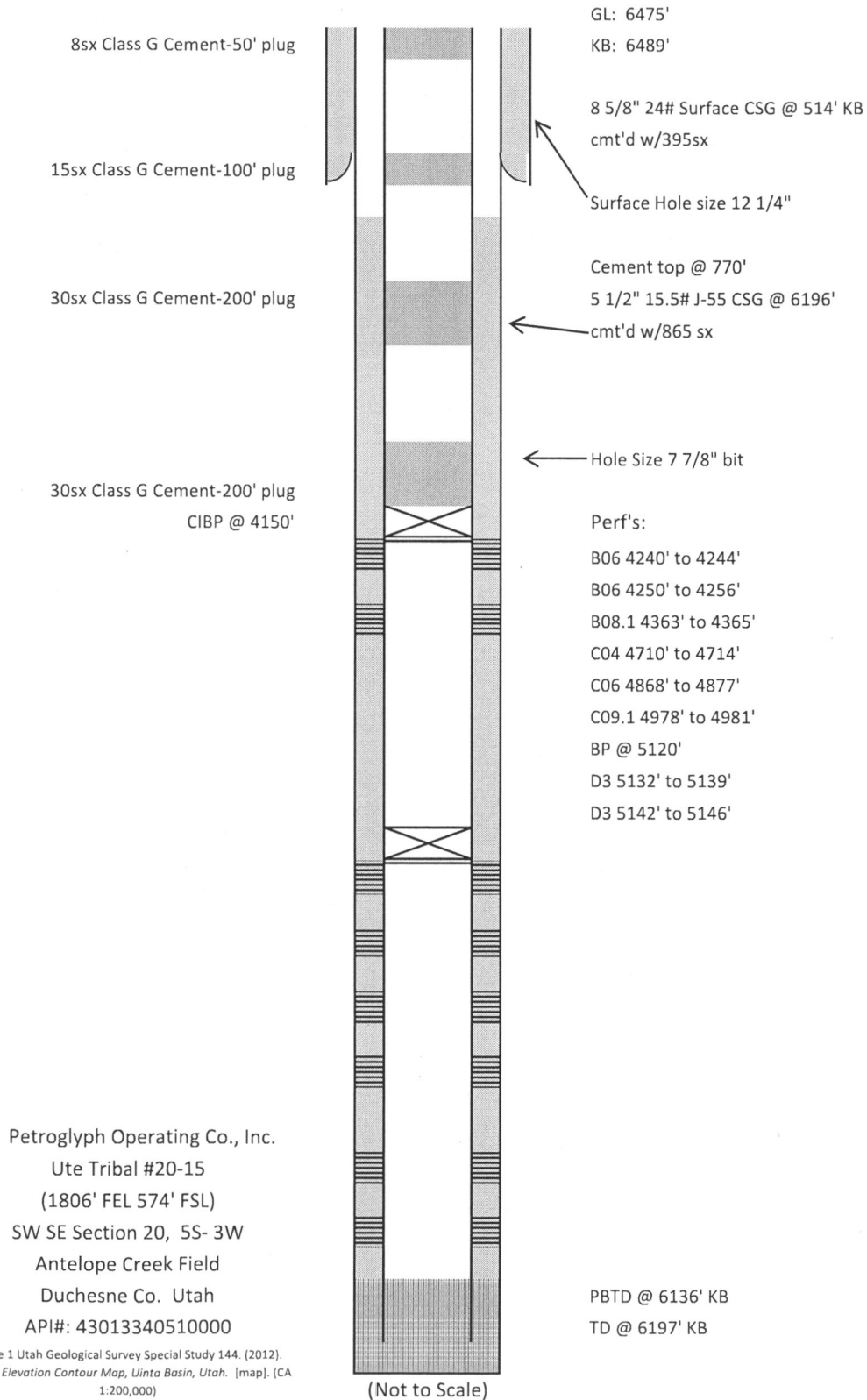
D3 5142' to 5146'

PBTD @ 6136' KB

TD @ 6197' KB

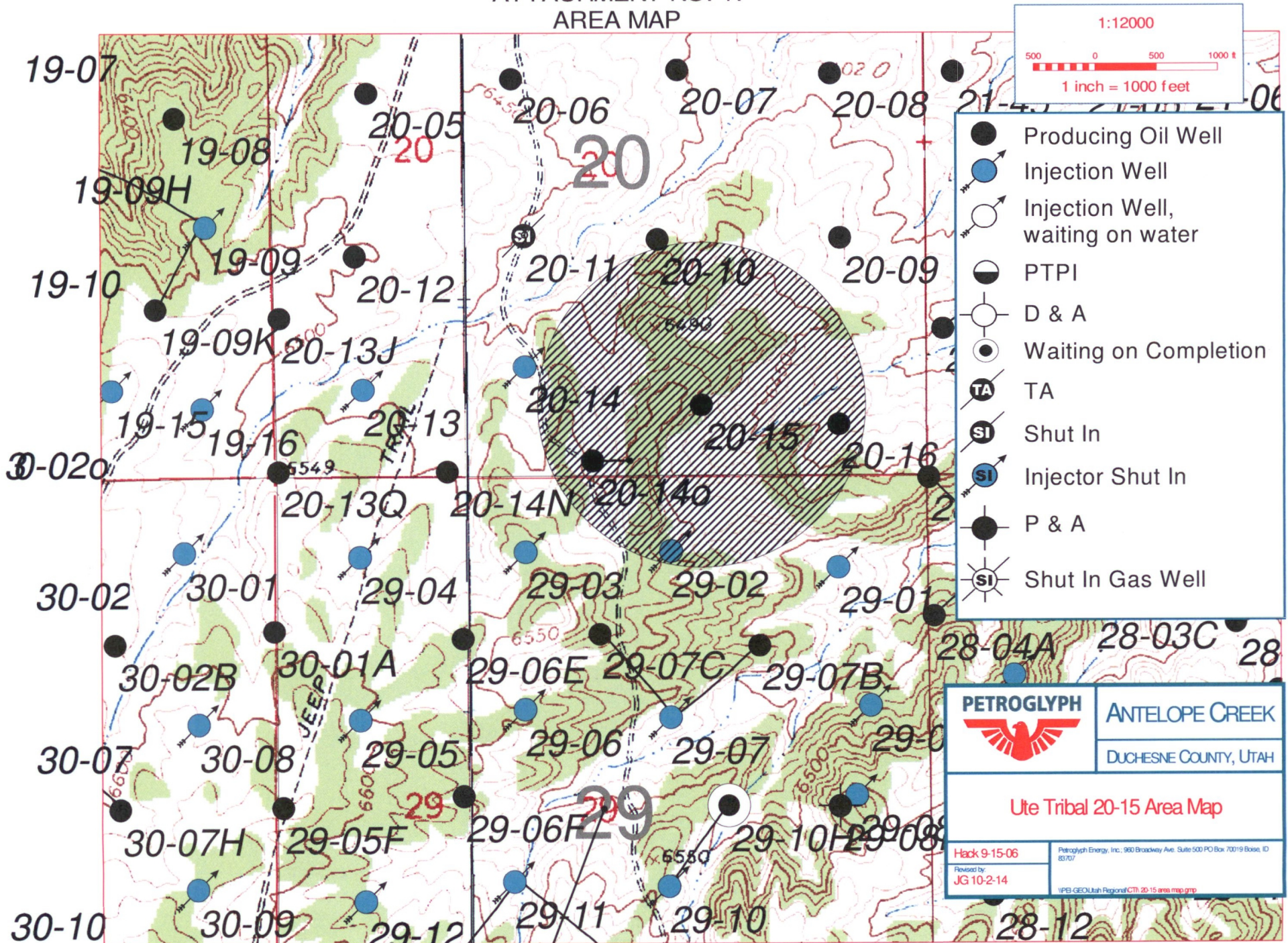


## Ute Tribal 20-15 Plug and Abandonment



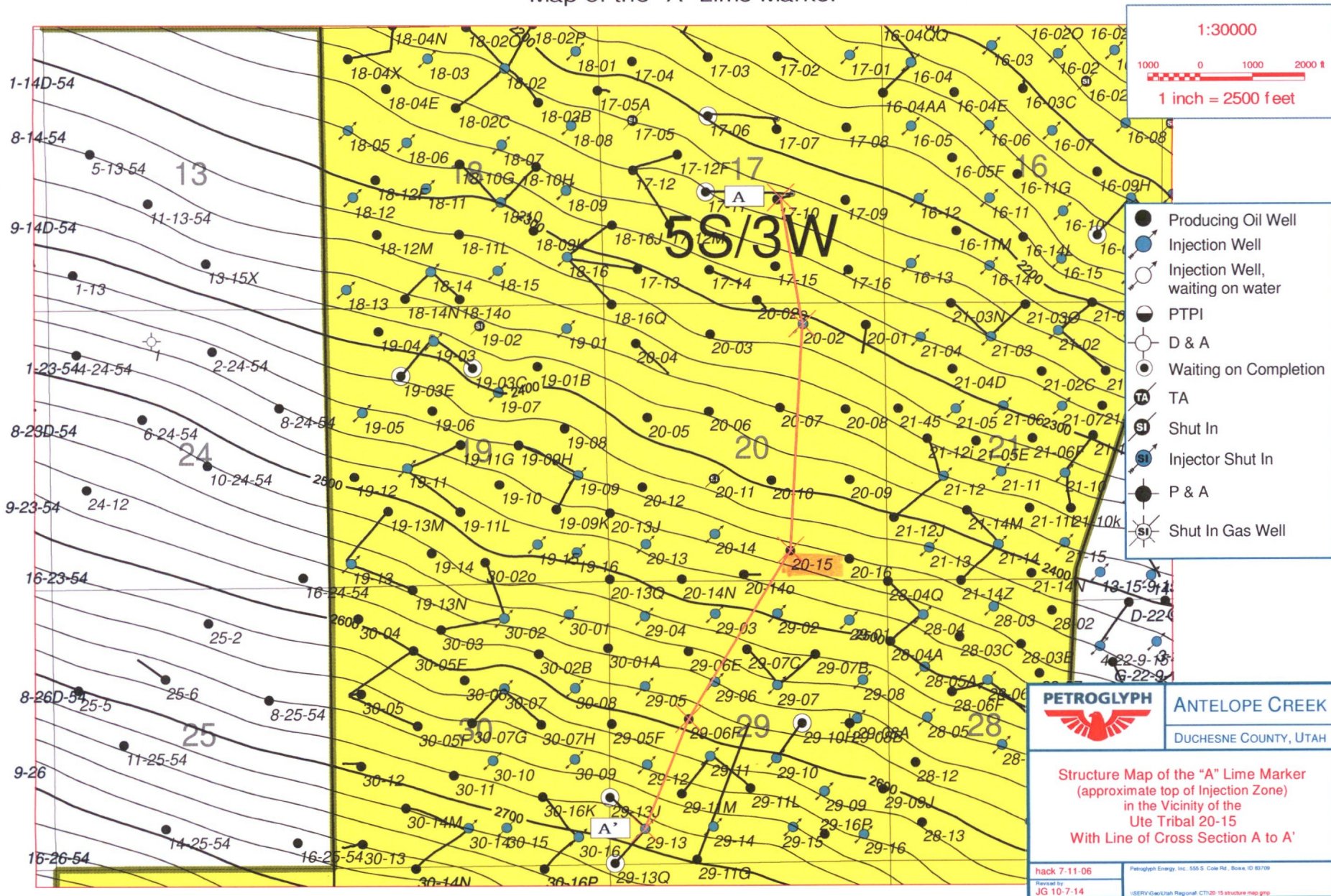


# ATTACHMENT NO. 1: AREA MAP



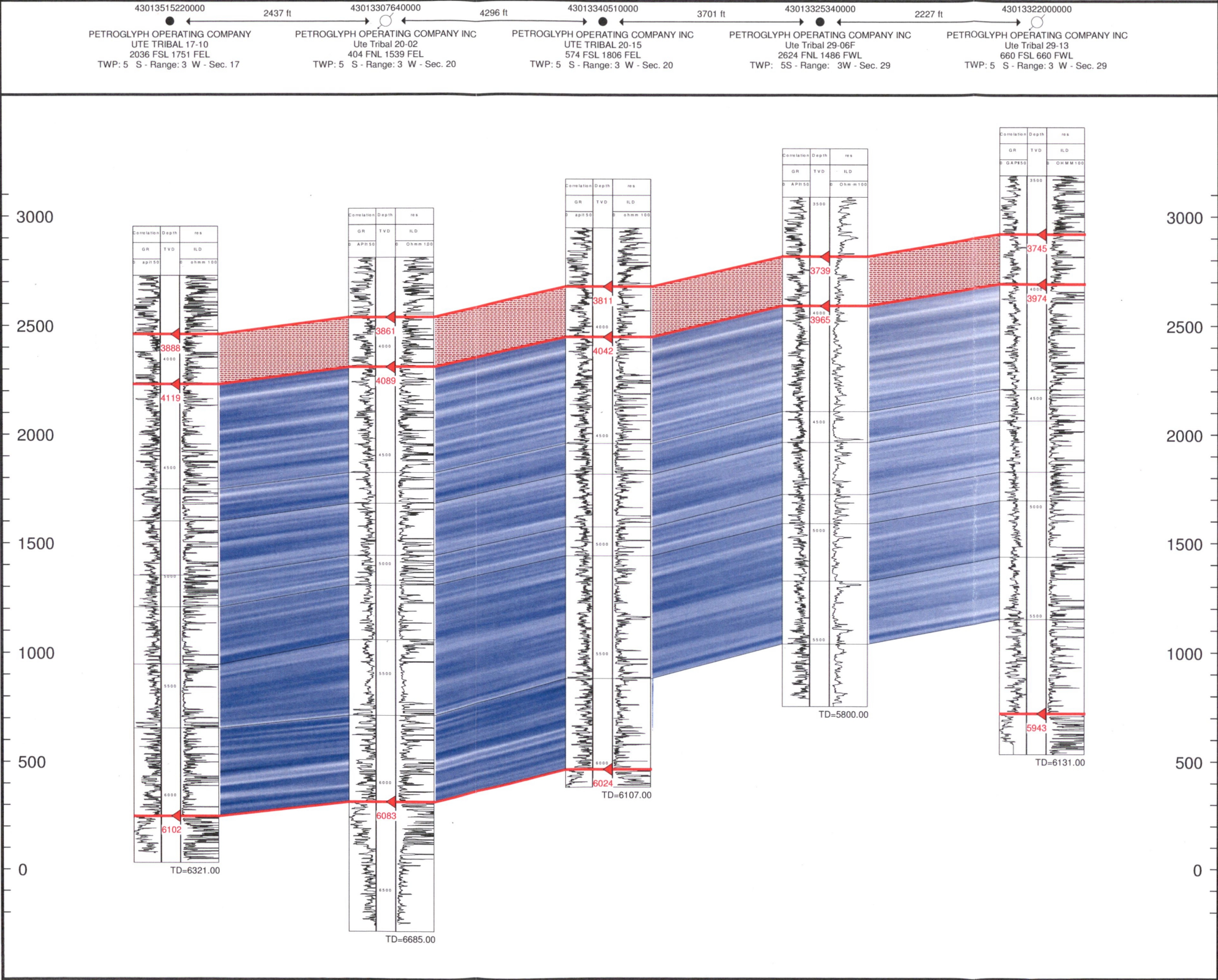


# ATTACHMENT NO. 3: Map of the "A" Lime Marker





Structural Cross Section A to A' in the Vicinity of Ute Tribal 20-15









## Cement Bond Index (in millivolts - mV)

Date: August 31, 2015

Operator: Petroglyph

Well: Ute Tribal 20-15

Permit: \_\_\_\_\_

Enter the following values:

Amplitude at 0% Bond (A-0) (in mV) = 72 mV

Amplitude at 100% Bond (A-100) (in mV) = 1 mV

Amplitude at 80% Bond (A-80) = 2.4 mV

$$[(0.2)\log A0 + (0.8)\log A100]$$

Amplitude at 90% Bond (A-90) = 1.5 mV

$$[(0.1)\log A0 + (0.9)\log A100]$$

Amplitude at 70% Bond (A-70) = 3.6 mV

$$[(0.3)\log A0 + (0.7)\log A100]$$

Amplitude at 60% Bond (A-60) = 5.5 mV

$$[(0.4)\log A0 + (0.6)\log A100]$$

no 80%



***Maximum Allowable Injection Pressure (MAIP)***  
***From Fracture Gradient***

Date: 08/31/2015

Operator: Petroglyph

Well: Ute Tribal 20-15

Permit #:

***Enter the following values:***

Specific Gravity of injectate =	<u>1.010</u>	g/cc
Depth to top of injection interval =	<u>4,042</u>	feet
Fracture Gradient ( F G ) =	<u>0.880</u>	psi/ft

***MAIP =*** **1,785** psig

*(rounded down to nearest 5 psig)*

*where:*

$$MSIP = [FG - (0.433 * SG)] * \text{Depth to top of injection interval} = 1789.272$$